VT
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AGENCY OF NATURAL RESOURCES

DEPARTMENT OF FORESTS, PARKS AND RECREATION

STATE OF VERMONT

FOREST INSECT AND DISEASE CONDITIONS
NORTHERN REGION

CALENDAR YEAR 1990

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30 November 1990

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INTRODUCTION

The information in this report is based largely on aerial surveys to detect defoliation, dieback, and mortality, as well as ground surveys and observations of forest resource protection personnel and other forestry and department staff.

Aerial surveys were flown in late June to mid-July to detect pear thrips damage and mid-July to early September to detect gypsy moth defoliation and anthracnose.

WEATHER SUMMARY

The 1990 growing season can be described in one word.....wet. Precipitation through the period 1 May - 30 September was 35 percent above normal in north-central Vermont (Table 1) and the rest of the region had similar above-normal precipitation. There were two very damaging thunderstorms in July that dropped four to five inches of rain in some locations and washed out many roads. Despite this, seasonal precipitation was very evenly spread throughout the spring and summer months. Only on a couple of occasions did one of our observers in north-central Vermont record no precipitation during any seven-day period, and there were no extended periods of dry weather this season anywhere in the region. Temperatures were near normal through the season, with April being slightly colder than normal and August slightly warmer than normal. Both 1989 and 1990 were very wet, and ground water conditions are well above normal in most locations now.

Table 1. North-Central Vermont Precipitation During the 1990 Growing Season*

MONTH	AVERAGE PRECIPITATION	DEPARTURE FROM NORMAL
May	4.42"	+1.20"
June	3.38"	+ .11"
July	3.87"	+ .21"
August	8.34"	+4.97"
September	2.52"	- .68"

*Vermont Division of Forestry Stations in Wolcott, Barre, Randolph, Fairlee, Worcester

Gypsy Moth, Lymantria dispar (Figure 1), populations continued to expand, with 13,769 acres defoliated compared to 5,940 acres in 1989 (Table 3). This is considered an underestimate of true area defoliated in 1990 because of less than optimum weather conditions and timing during the annual aerial surveys conducted to detect this insect. Addison County with 11,773 acres defoliated had the most damage (Table 3, Figure 2). An additional 11,237 acres were protected by an aerial application of biological insecticide.

Table 3. Mapped Acres of 1990 Gypsy Moth Defoliation

County	Damage Level*			Total Acres
	Light	Moderate	Heavy	
Addison	514	6,191	5,068	11,773
Chittenden	453	868	398	1,719
Franklin		26	51	77
Orange		100	100	200
Total	967	7,185	5,612	13,769

*Light = less than 30% defoliation
Moderate = 30-60%
Heavy = greater than 60%

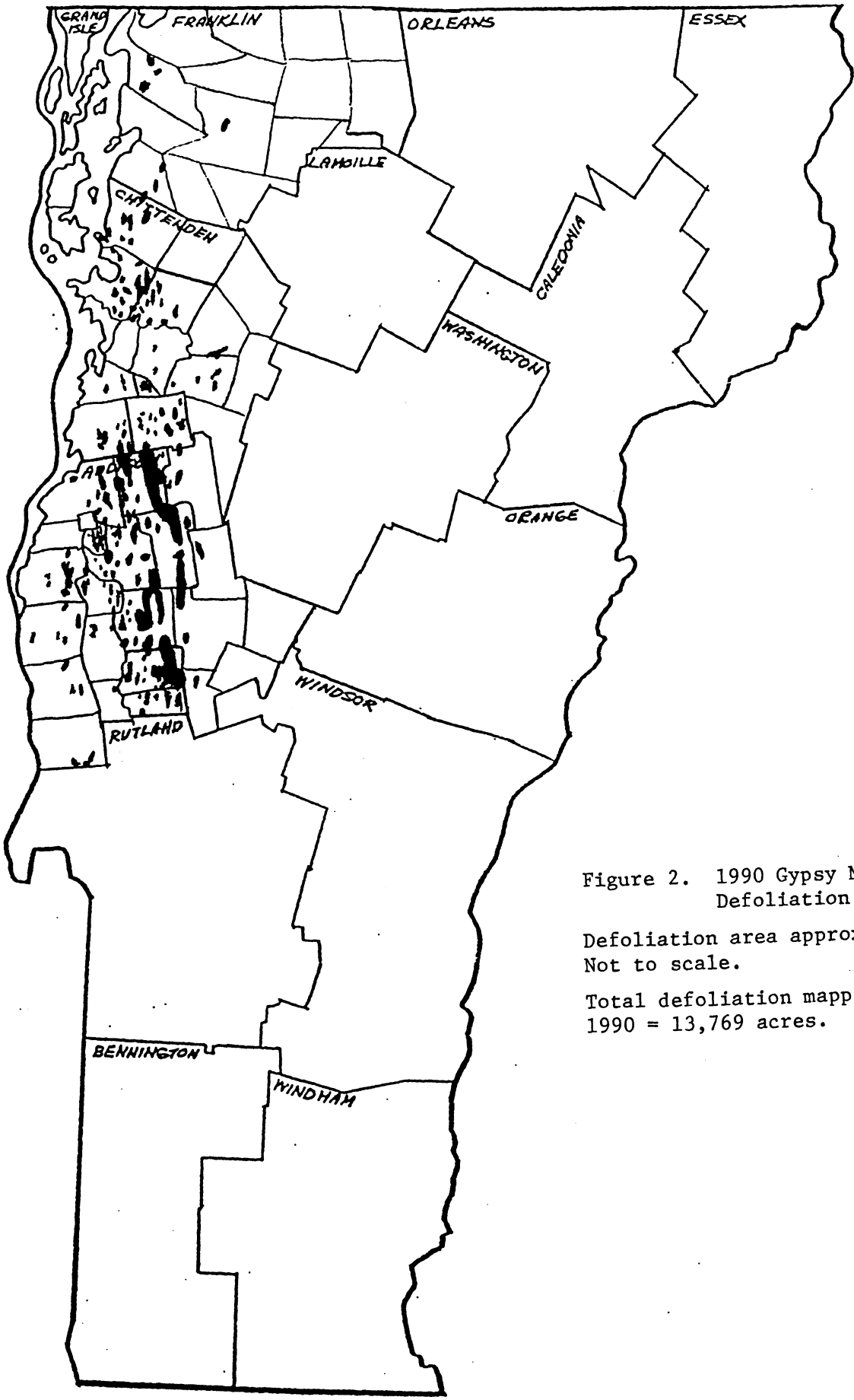


Figure 2. 1990 Gypsy Moth Defoliation

Defoliation area approximate. Not to scale.

Total defoliation mapped in 1990 = 13,769 acres.

Gypsy moth populations were affected by the fungus Entomophaga maimaiga again this year for the second consecutive year. This fungus was introduced to the Boston area from Japan in 1910-1911 and began acting as a natural control last year in northeastern areas with above normal precipitation. With an even greater increase in precipitation this year, the fungus was even more widespread, with confirmation of its occurrence further north in the state (Milton) than in 1989. There was also an abundance of virus-killed gypsy moth larvae in many locations this year, making it difficult to determine which was the most prevalent mortality factor. Gypsy moth populations for 1991 are generally lower than in 1989 but are increasing in some northern locations, as reflected by the focal area monitoring data (Table 4).

Table 4. Gypsy Moth Egg Mass Counts From Focal Area Monitoring plots: 1986-1990

Plot Location	Number of Egg Masses* 1986	1987	1988	1989	1990
Arrowhead**	5	21	48	96	3
Brigham Hill***	10	37	28	74	212
Middlesex	0	0	1	19	23
Sandbar	-	45	173	129	57
Average	5	26	63	80	74

*Average per plot for two, 15m diameter (.045AC) burlap-banded plots.
**Aerial sprayed with B.t. (Foray) in 1990.
***Aerial sprayed with B.t. (SAN415) in 1988.

A cooperative gypsy moth suppression project was conducted in late May to protect foliage on 7,734 acres in Chittenden County and 3,503 acres in Addison County, for a total of 11,237 acres. This was a cooperative effort between our department, the Vermont Department of Agriculture, and the U.S. Forest Service. The latter agency also provided 50 percent cost reimbursement. Most of the acreage in Addison County (3,202AC) was at the request of the Green Mountain National Forest and most of the acreage in Chittenden County (7,514AC) was at the request of the following municipalities: Burlington, South Burlington, Colchester, Essex (town and village), and Winooski.

All spray blocks were treated once with Foray 48B (Bacillus thuringiensis var. kurstaki), applied by small, twin-engine, fixed-wing aircraft at the rate of 24 Billion International Units (64 oz.) per acre (Figure 3). Larvae were at optimum development size (46% instar 1; 51% instar 2; 3% instar 3) for the Foray to be effective, but noticeable defoliation (average of 9%) had already taken place prior to treatment. Foliage expansion at time of treatment averaged about 80 percent. Weather conditions on the days of spraying were excellent and no rain was received for at least 30 hours after treatment.

To evaluate defoliation, 10 to 30 oak trees per block were rated from the ground for 26 of the Chittenden County blocks. This was done on the day of treatment to estimate presepray defoliation, and again in mid-July to estimate final defoliation. This was compared to data from 30 trees per block for five unsprayed blocks in the same general area. Prespray (1989) egg mass counts taken in the fall of 1989 to determine spray blocks were based on a combination of five minute walk, egg mass counts and one-fortieth acre plots while postspray (1990) counts were based on 194 fixed-area plots, mostly one-fortieth acre in size, distributed among 62 spray blocks and six untreated check blocks.

Some moderate to heavy defoliation (about 3% of the area) took place in some spray blocks, but overall, the project was very successful. Defoliation in the town project spray blocks averaged 12 percent compared to 52 percent in the unsprayed areas (Figure 4). Some oaks suffered considerable defoliation by first and second instar larvae just prior to treatment (Figure 5). Defoliation on the days of spraying averaged nine percent. Thus, on average, only three percent additional defoliation took place after treatment. Postspray egg mass counts averaged 299 per acre for Chittenden County spray blocks compared to prespray counts of 5,136 per acre (Figure 6). Untreated areas (5-Chittenden County/1-Addison County) averaged 2,761 postspray (1990) egg masses per acre compared to 4,057 prespray (1989) egg masses per acre. Addison County spray blocks, excluding the Green Mountain National Forest, averaged 155 postspray egg masses per acre compared to 2,418 prespray egg masses per acre. Only three spray blocks, totaling 212 acres, have high enough egg mass counts (more than 1,000 per acre) to potentially result in moderate to heavy defoliation in 1991.

Several areas in the Connecticut River Valley in Orange County that had high egg mass counts in the fall of 1989 apparently suffered winter mortality of egg masses above snowline, and 1990 defoliation was only light. Many surviving larvae were infected by fungus and virus. Addison and Chittenden Counties are expected to experience some defoliation in 1991, but it is likely to be much less widespread and less severe than in 1990.

Figure 1. Gypsy moth larva (fifth instar).

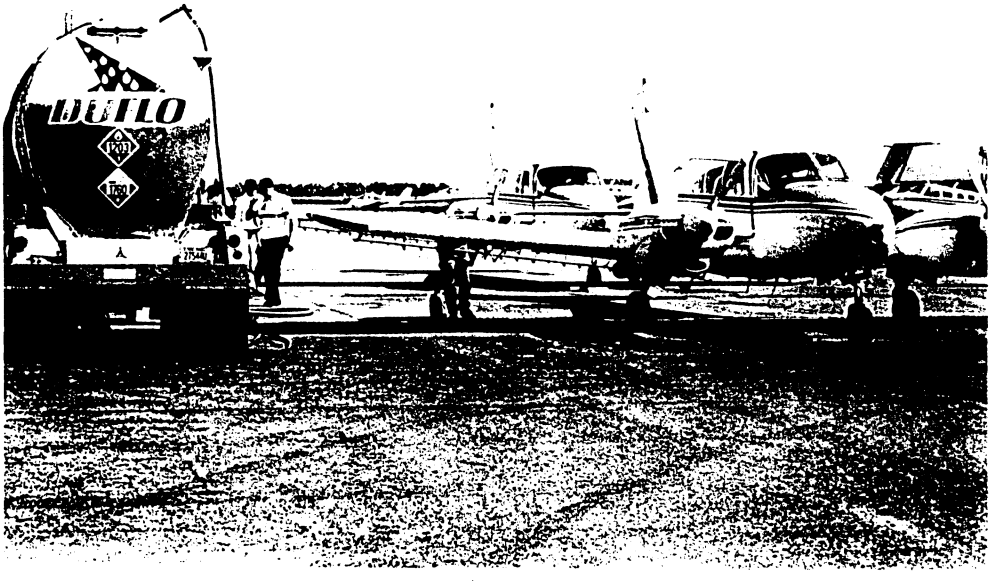


Figure 3. Two aztec spray planes operated by Duflo Spray Chemical, Inc. getting ready for gypsy moth spray operations, Burlington International Airport, 27 May 1990.

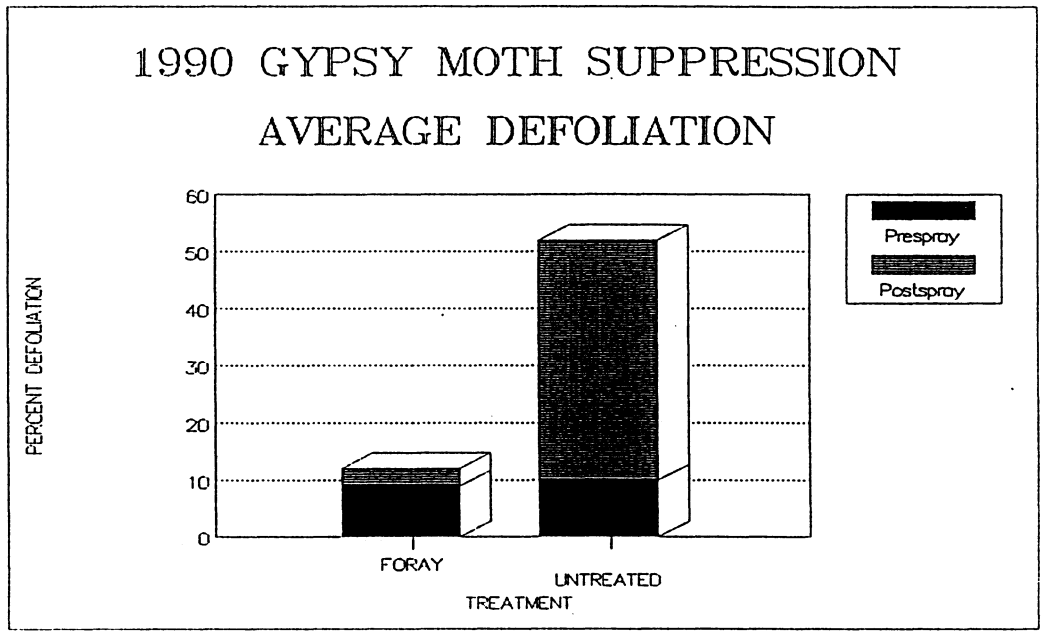


Figure 4. Average gypsy moth defoliation in 25 Chittenden County blocks treated with Foray in 1990 compared to 5 untreated blocks.

Figure 5. Heavy defoliation of young oak leaves by first and second instar gypsy moth larvae.

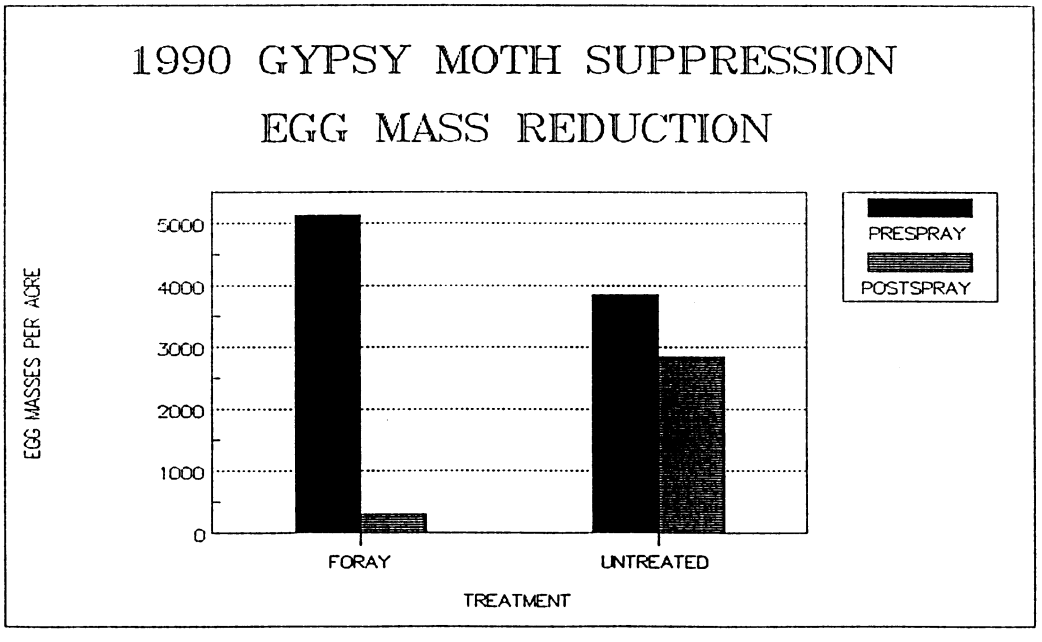


Figure 6. Average gypsy moth prespray (1989) and post-spray (1990) egg mass counts in 39 Chittenden County blocks treated with Foray in 1990 compared to 5 untreated blocks.

Maple Leaf Cutter, Paraclemensia acerifoliella, populations increased substantially throughout the region, with widespread light to moderate defoliation evident by early September, plus scattered areas of heavy defoliation. Heavy damage was mostly confined to lower and inner (next to trunk) crowns of sugar maple making aerial detection extremely difficult. This defoliation pattern is typical of other years when rainy periods coincided with adult emergence, probably resulting in a confinement of egg laying to the more protected areas of the crown. Areas of heavy defoliation detected from the air included 131 acres in Caledonia County, 62 acres in Essex County, and 274 acres in Orleans County, for a total of 467 acres (Table 5, Figure 7). An additional 135 acres of heavy defoliation were detected in Franklin County (Richford) by a ground visit. This insect is likely to cause more heavy defoliation in 1991.

Saddled Prominent, Heterocampa guttivata, is still present in Orange County, but very little defoliation occurred this year. Pupae could be found in several locations in the county this fall so this insect has the potential to increase in 1991. Elsewhere in the region few larvae were observed.

Table 5. 1990 Mapped Acres of Heavy Maple Leaf Cutter Defoliation*

County	Acres
Caledonia	131
Essex	62
Orleans	274
Total	467

*Heavy = more than 60% defoliation.

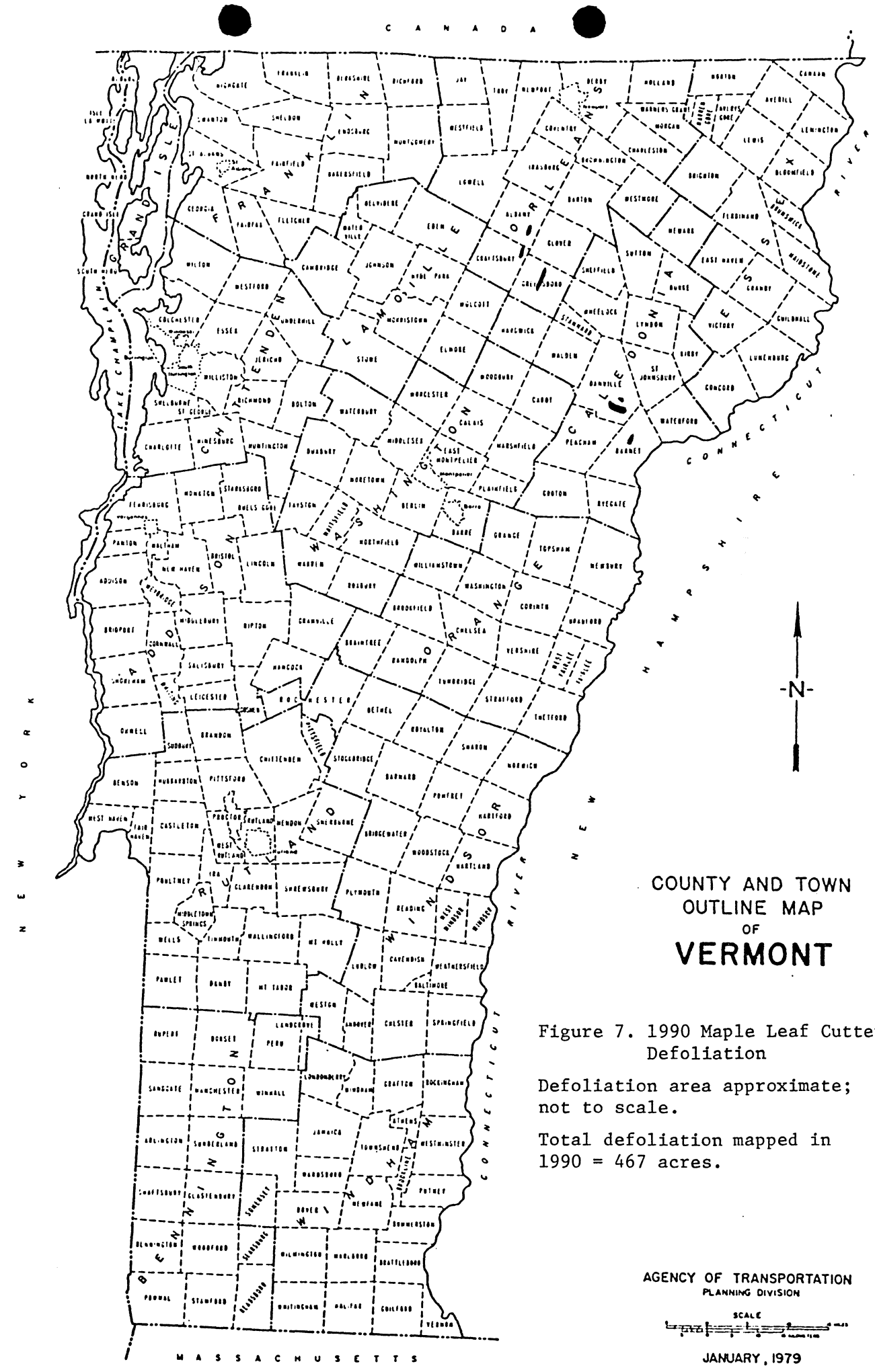


Figure 7. 1990 Maple Leaf Cutter Defoliation

Defoliation area approximate; not to scale.

Total defoliation mapped in 1990 = 467 acres.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
American Aspen Beetle *Gonioctena americana*			N.O.*
American Dagger Moth *Acronicta americana*			N.O.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Hyde Park	Trace damage only
Birch Leaf Miner *Fenusa pusilla*	Paper Birch Gray Birch Yellow Birch	Widespread 210 acres aerially mapped in Franklin & Chittenden Counties	Unusually little defoliation from first generation probably due to wet weather during egg laying; some moderate to heavy defoliation from second generation feeding
Birch Skeletonizer *Bucculatrix canadensisella*	White Birch Yellow Birch		N.O.
Bruce Spanworm *Operophtera bruceata*	Sugar Maple	Stowe Bristol Peacham	A few moths observed in November
Cecropia Moth *Hyalophora cecropia*	Crab Apple	Morristown	Unusually heavy infestation on ornamental, but only light defoliation
Cherry Scallop Shell Moth *Hydria prunivorata*			N.O.

*N.O. = not observed

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Dogwood Sawfly *Macremphytus tarsatus*	Silky Dogwood	Bristol Middlebury	Light defoliation of ornamentals
Early Birch Leaf Edgeminer *Messa nana*	Birch sp.		N.O.
Eastern Tent Caterpillar *Malacosoma americanum*	Cherry Apple	Widespread	Common but decreased from 1989 levels
Elm Leaf Beetle *Pyrrhalta luteola*	American Elm	Scattered	Very light defoliation
Elm Leaf Miner *Fenusa ulmi*	Elm		N.O.
Fall Cankerworm *Alsophila pometaria*			N.O.
Fall Webworm *Hyphantrea cunea*	Hardwoods	Widespread except Northeast Kingdom	Much more noticeable than during the past few years
Forest Tent Caterpillar *Malacosoma disstria*			See narrative
Green Striped Mapleworm *Anisota rubicunda*	Maples		N.O.
Gypsy Moth *Lymantria dispar*			See narrative

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Half Winged Geometer *Phigalia titea*	Red Oak Sugar Maple		N.O.
Japanese Beetle *Popillia japonica*	Ornamentals	Widespread	Light but increasing compared to 1989
Large Aspen Tortrix *Choristoneura conflictana*			N.O.
Linden Looper *Erranis tiliaria*			N.O.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	Chittenden Washington Counties	Some moderate to heavy defoliation
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative
Maple Leafblotch Miner *Cameraria aceriella*		Chittenden Franklin	Common throughout; light damage; first year that this miner has been very noticeable
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple Red Maple	Widespread	Unusually common this year, occasionally causing moderate defoliation of sugar maples
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Widespread	Common this year for the first time in several years; light defoliation
Mountain Ash Sawfly *Pristiphora geniculata*	Mountain Ash	Caledonia County	Decreased this year; detected in only one area

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Oak Leafroller *Archips semiferanus*			N.O.
Oak Leaf Tier *Croesia semipurpurana*	Red Oak	Essex	One of three pheromone traps on Brigham Hill caught 1 moth, but all three traps in Milton (Sandbar) were negative
Oak Skeletonizer *Bucculatrix ainsliella*	Oak		N.O.
Orange-humped Mapleworm *Symmerista leucitys*	Sugar Maple		N.O.
Pear Sawfly *Caliroa cerasi*	Hawthorne	Danville	Remains present
Pin Oak Sawfly *Caliroa sp.*			N.O.
Red-humped Oakworm *Symmerista canicosta*	Red Oak		N.O.
Rose Chafer *Macrodactylus subspinosus*	Hardwood Ornamentals	St.Johnsbury	Decreasing but noticeable
Saddled Prominent *Heterocampa guttivata*			See narrative
Satin Moth *Leucoma salicis*	Balsam Poplar Cottonwood	Orange Lamoille Counties	Scattered light defoliation in Lamoille County; heavy defoliation in Randolph; less common than in 1989

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Solitary Leaf Roller *Sparganothis pettitana*	Sugar Maple	Lamoille County	Scattered, light
Solitary Oak Leaf Miner *Cameraria hamadryadella*			N.O.
Spiny Elm Caterpillar *Nymphalis antiopa*			N.O.
Spring Cankerworm *Paleacrita vernata*			N.O.
Uglynest Caterpillar *Archips cerasivoranus*	Cherry	Widely scattered	Occasionally observed

SOFTWOOD DEFOLIATORS

Spruce Budworm, Choristoneura fumiferana, continued at extremely low levels in 1990, with no visible defoliation and no larvae detected. Only one budworm moth was caught by use of pheromone traps again this year.

Pheromone traps have been used in the state ever since 1983, the last year of heavy budworm defoliation, and moth catch reflects the dramatic drop in population levels since then (Figure 8). For the past three years, 20 sites have received three Multi-pher traps per site (Table 6). Only one trap from a different location (Figure 9) each year (Sutton-88; Newbury-89; Wheelock-90) has caught any moths, indicating that moth catch is probably a random event and there are no apparent "hot spots" or "focal areas" for spruce budworm. All traps were baited with "Biolures" this year and this is expected to be the standard lure from now on.

Table 6. Average Number of Spruce Budworm Moths Caught Per Trap in Pheromone Traps, 1987-1990*.

Lure	1987	1988	1989	1990
PVC	0.01	0.05	0.00	--
Biolure	--	--	0.03	0.02
Number of Sites	19	20	10 per lure	20

*Multi-pher traps: 3 per site in 1990, 1989, and 1988; 3-5 per site in 1987.

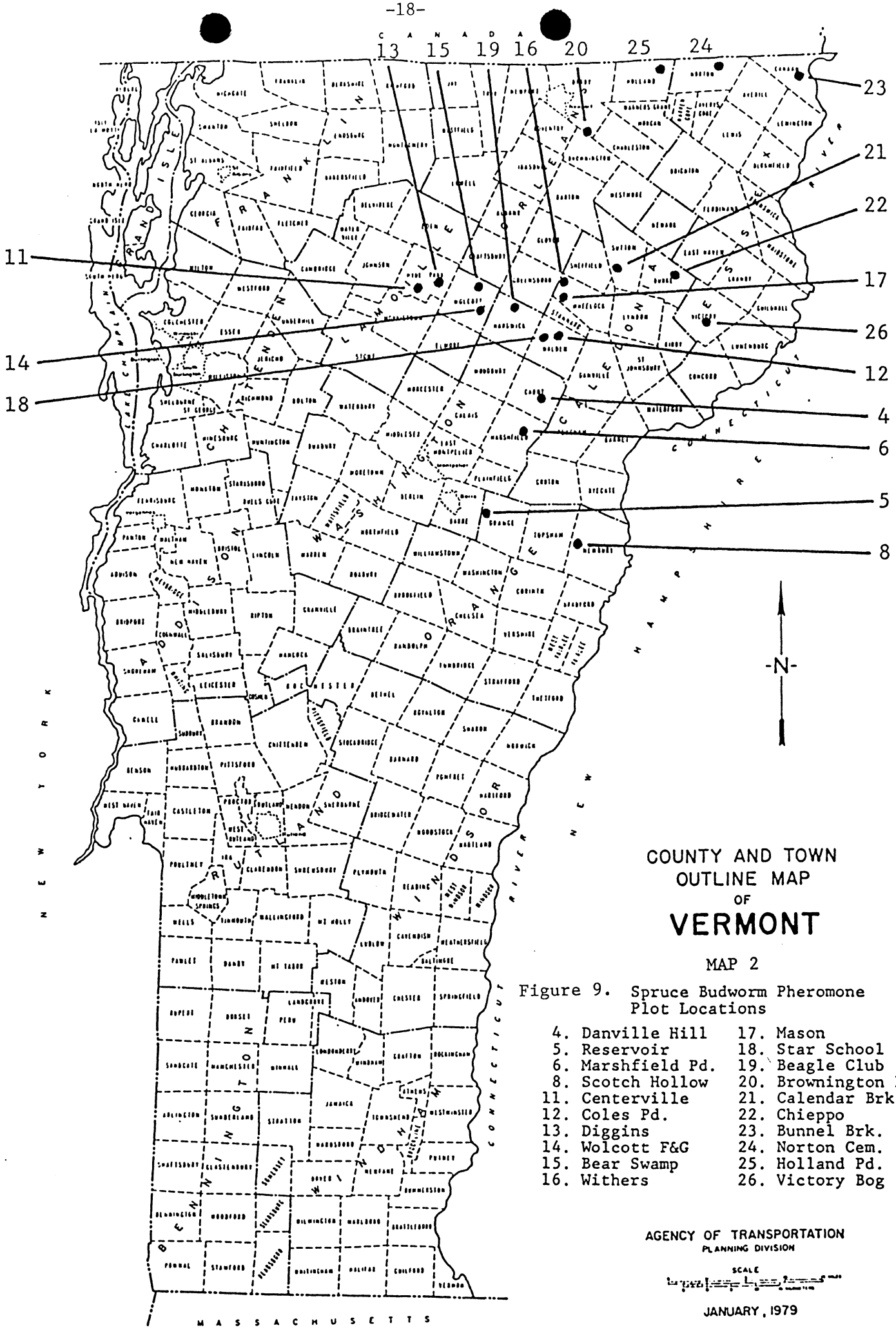


Figure 9. Spruce Budworm Pheromone Plot Locations

4. Danville Hill
5. Reservoir
6. Marshfield Pd.
8. Scotch Hollow
11. Centerville
12. Coles Pd.
13. Diggins
14. Wolcott F&G
15. Bear Swamp
16. Withers
17. Mason
18. Star School
19. Beagle Club
20. Brownington Pd
21. Calendar Brk.
22. Chieppo
23. Bunnel Brk.
24. Norton Cem.
25. Holland Pd.
26. Victory Bog

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae	Widespread	Ornamentals-increasing with abundant light defoliation and some moderate defoliation
Balsam Fir Sawfly *Neodiprion abietis*	Balsam Fir Blue Spruce	Windsor Washington Lamoille Orange Counties	Common in 1989 for the first time but not observed in 1990
Green Hemlock Needleminer *Coleotechnites apicitripunctella*	Hemlock		N.O.
Hemlock Looper *Lambdina fiscellaria*	Hemlock		N.O.
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine		N.O.
Larch Casebearer *Coleophora laricella*	European Larch Japanese Larch Eastern Larch	Widespread	Increasing; common this year with some scattered moderate defoliation
Larch Sawfly *Pristophora erichosonii*			N.O.
Pine False Webworm *Acantholyda erythrocephala*	Red Pine		Common in 1989, but not observed this year
Pine Webworm *Tetralopha robustella*			N.O.
Red-Headed Pine Sawfly *Neodiprion lecontei*	Red Pine		N.O.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Bud Moth *Zeiraphera canadensis*	White Spruce	Walden Waterville	Moderate infestations in two Christmas tree plantations; increasing
Spruce Budworm *Choristoneura fumiferana*			See narrative
White Pine Sawfly *Neodiprion pinetum*			N.O.
Yellow-headed Spruce Sawfly *Pikonema alaskensis*	White Spruce Red Spruce Blue Spruce	Waterville Danville St.Johnsbury Randolph	More reports than in 1989; Randolph plantation that suffered heavy damage in 1988 had only a few larvae early in the season; population here collapsed. Increasing elsewhere

Pear Thrips, Taeniothrips inconsequens, defoliated 26,773 acres that could be aerially mapped compared to 3,170 acres in 1989. Most of the damage occurred in Washington and Lamoille Counties (Table 8, Figure 10). As in the past, sugar maple was the primary host, but one stand in Camel's Hump State Forest had American beech overstory trees with upper crown damage severe enough to cause refoliation. Many of the sugar maples attacked by thrips early in the season were further damaged by one or more of the following agents later on: anthracnose, maple leaf cutter, maple webworm, and maple trumpet skeletonizer. The cumulative effect resulted in moderate defoliation for many trees that were near the upper end of the light category (i.e. 20-30% defoliation) for thrips damage. Mapped acreage is conservative due to the fact that thrips damage is so highly variable and undefined areas with a scattering of damaged trees are difficult to detect or map.

Refoliation associated with thrips damage was highly variable this year, even within stands. Some trees refoliated quickly while others refoliated partially or not at all. Year-to-year refoliation and damage trends for individual trees have been equally variable. This year, some trees had portions of their crowns that were heavily defoliated, while the remainder received little visible damage.

Table 8. Mapped Acres of 1990 Damage by Pear Thrips

County	Damage Level*			Total Acres
	Light	Moderate	Heavy	
Addison		335	335	670
Caledonia				0
Chittenden		780	905	1,685
Essex				0
Franklin		100	100	200
Grand Isle				0
Lamoille	2,374	5,257	1,361	8,992
Orange	3,104	855	188	4,147
Orleans				0
Washington	5,542	4,166	1,371	11,079
Total	11,020	11,493	4,260	26,773

*Damage based on leaf area reduction as follows:
Light = less than 30%; Moderate = 31-60%; Heavy = more than 60%.

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Aphids *Cinara sp.*	Balsam Fir White Pine	Craftsbury Morristown E.Albany	Damaging 60 acres of Christmas trees
Aphids *Periphyllus spp.*	Many		Not detected this year; heavy in 1988, decreasing in 1989
Balsam Gall Midge *Pardiplosis tumifex*	Balsam Fir		See narrative
Balsam Twig Aphid *Mindarus abietinus*	Balsam Fir		See narrative
Balsam Woolly Adelgid *Adelges piceae*	Balsam Fir		N.O.
Beech Scale *Cryptococcus fagisuga*	Beech		See Beech Bark Disease
Birch Budgall Mite *Aceria rudis*	Birch		N.O.
Cooley Spruce Gall Adelgid *Adelges cooleyi*	White Spruce	Widely scattered	Decreasing; only trace populations in Christmas trees this year
Cottony Maple Scale *Pulvinaria innumerabilis*	Sugar Maple		N.O.
Eastern Spruce Gall Adelgid *Adelges abietis*	Red Spruce White Spruce	Widespread	Increasing; 82 acres of mostly mod-heavy damage to white spruce Christmas trees compared to 36 acres of light damage in 1989

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Hemlock Woolly Adelgid *Adelges tsugae*	Hemlock		Not detected in northern region
Lacebugs *Corythucha sp.*	American Elm Balsam Poplar	Washington Orange Chittenden Counties	Decreasing, but damage noticeable along roads and streams
Leafhoppers	Sugar Maple Msc. hardwood	Widespread	Light damage noticeable
Lecanium Scale *Lecanium sp.*	Red Oak Sugar Maple		Not detected; was common in 1988
Maple Spindle Gall Mites *Vasates aceris-crumena*	Sugar Maple	Widespread	Remains common
Oystershell Scale *Lepidosaphes ulmi*	American Beech		See narrative
Pear Thrips *Taeniothrips inconsequens*	Sugar Maple		See narrative
Pine Bark Adelgid *Pineus strobi*	White Pine	Throughout	Heavily infested individual trees, common in widely scattered locations
Pine Leaf Adelgid *Pineus pinifoliae*	White Pine		N.O.
Pine Needle Midge *Contarinea baeri*	Scots Pine		N.O.
Pine Needle Scale *Chionapsis pinifoliae*	Mugho Pine	Morrisville	Trace levels

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Spittlebug *Aphrophora parallela*	Scots Pine White Pine Red Pine		156 acres of Christmas trees reported as infested; no shoot damage observed
Pine Thrips *Gnophothrips sp.*	Scots Pine		N.O.
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine		N.O.
Root Aphid *Prociphilus americanus*	Balsam Fir Fraser Fir		N.O.
Spruce Bud Scale *Physokermes piceae*			N.O.
Spruce Spider Mite *Oligonychus ununguis*			N.O.
Treehoppers *Membracidae*			N.O.
Woolly Alder Aphid *Prociphilus tessellatus*	Silver Maple Alder		N.O.
Woolly Apple Aphid *Eriosoma lanigerum*	American Elm		N.O.

BUD, SHOOT, AND STEM INSECTS

The Balsam Shootboring Sawfly, Pleroneura brunneicornis, continued its past trend of heaviest populations in even years. This year damage was detected in 373 acres of balsam and Fraser fir, of which 213 acres were moderate to heavy. This compares to 48 acres of light to moderate damage in 1989. Some information from Maine Forest Service entomologists indicates that the adult sawflies may be laying eggs long before bud break. This would explain why we have not observed any adults in Vermont at or just before bud break when balsam twig aphid surveys are conducted.

OTHER BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ant *Formica exsectoides*	Scots Pine Douglas-Fir	Cornwall	Some mortality in Christmas tree plantation
Ambrosia Beetle *Scolytidae*	Paper Birch	Groton	Light damage
Balsam Shoot-boring Sawfly *Pleroneura brunneicornis*	Balsam Fir		See narrative
Butternut Curculio *Conotrachelus juglandis*			N.O.
Coneworm *Dioryctria spp.*	Fraser Fir Spruces		N.O.
Locust Borer *Megacyllene robiniae*			N.O.
Maple Petiole Borer *Caulocampus acericaulis*			N.O.
Northern Pine Weevil *Pissodes approximatus*			N.O.

OTHER BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Pales Weevil *Hylobius pales*	Scots Pine	Widespread	Damage to Christmas trees similar to 1989, 170 acres of light to moderate damage reported
Pine Gall Weevil *Podapion gallicola*			N.O.
Pine Root Collar Weevil *Hylobius radicis*	Scots Pine	Cornwall	Causing about 5% mortality of 3'-5' tall Christmas trees
Pitted Ambrosia Beetle *Corthylus punctatissimus*	Sugar Maple Seedlings	Addison Chittenden Franklin Caledonia Orleans Counties	Present but decreasing compared to 1989
Pseudanthonomus validus	Yellow Birch		N.O.
Round-headed Apple Tree Borer *Saperda candida*	Apple	Victory Danville	Damaging apples in 5 homeowner locations
Twig Pruner *Elaphidionoides villosus*			N.O.
White Pine Weevil *Pissodes strobi*	White Pine Scots Pine Blue Spruce Norway Spruce White Spruce Red Spruce	Widespread	Common, but at decreased damage levels
White Spotted Sawyer *Monochamus scutellatus*			N.O.

BARK BEETLES

INSECT	HOST(S)	LOCALITY	REMARKS
Bronze Birch Borer *Agrilus anxius*			N.O.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Widespread	Decreasing; no new areas of larch decline detected this year compared to 46 acres in 1989 and 646 acres in 1988
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*	American Elm	Widespread	See Dutch Elm Disease
Pine Engraver *Ips pini*	Red Pine		N.O.

ROOT INSECTS

The Conifer Swift Moth, *Korsheltellus gracilis*, formerly called the Ghost Moth, continues to be found associated with feeding wounds on the roots of balsam fir and red spruce at high elevations in northern Vermont.

FOREST DISEASES

STEM DISEASES

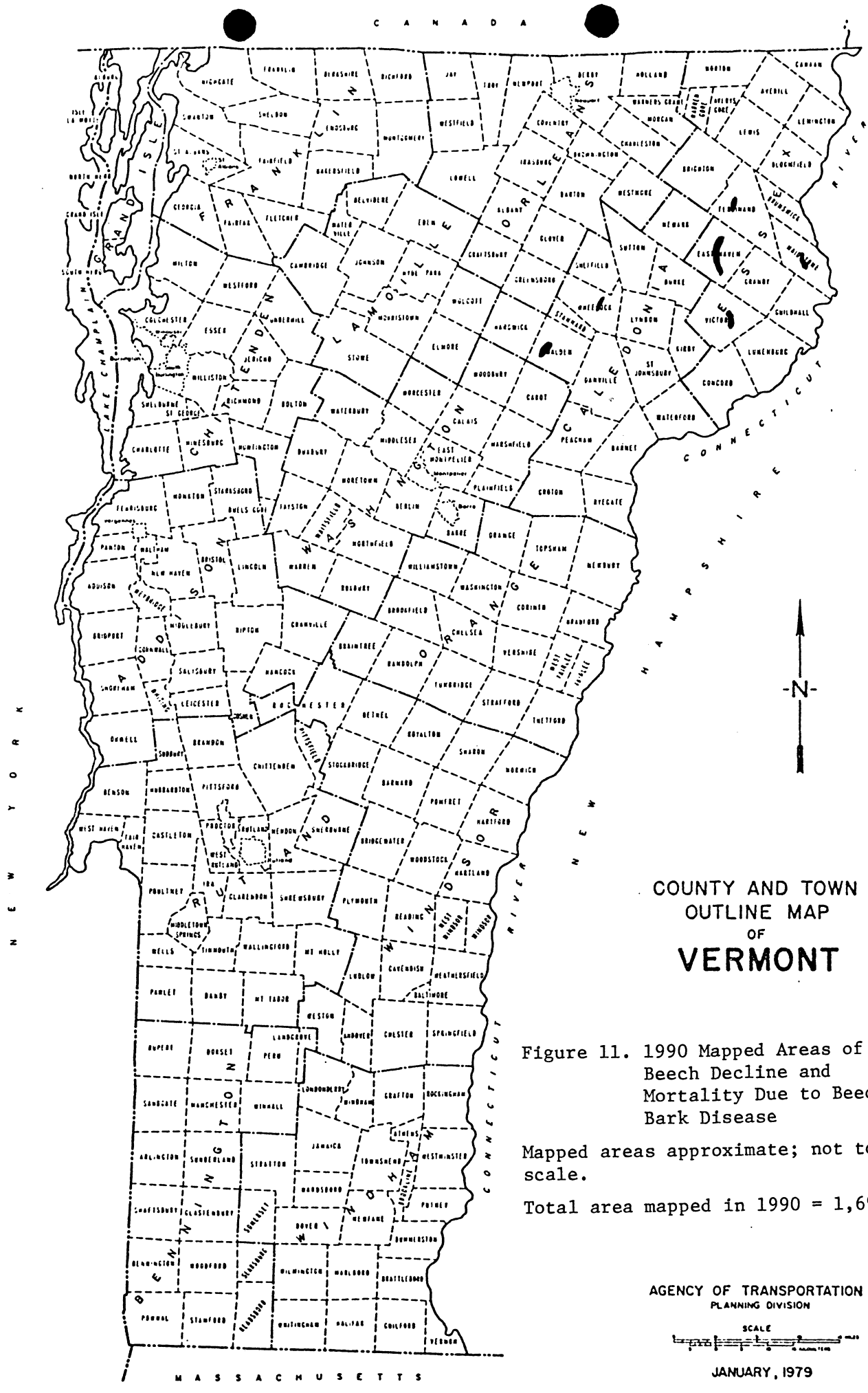
Beech Bark Disease, caused by Cryptococcus fagisuga and Nectria coccinea var. faginata, became noticeable enough this year that 1,691 acres of damage was mapped in the Northeast Kingdom during the annual aerial survey (Table 9, Figure 11). This disease complex appeared to be on the increase in recent years, but this is the first time in many years that mortality and decline has been heavy enough to detect from the air. Elsewhere in the region, except for the Champlain Valley, scattered yellow crowns of infected beech trees were more evident than usual by mid to late summer.

Table 9. Mapped Acres of 1990 Beech Decline and Mortality Due To Beech Bark Disease.

County	Acres
Caledonia	742
Essex	703
Orleans	246
Total	1691

Scleroderris Canker, caused by Ascocalyx abientina, was not found in any new locations for the fourth consecutive year. A total of 53 Christmas tree plantations within the quarantine zone (Figure 12), and 92 red and Scots pine plantations in 18 towns bordering the quarantine area, were surveyed for the presence of the disease, all with negative results. The disease does not appear to be spreading outside of previously infected plantations, and within infested plantations the rate of spread remains slow.

The total number of plantations in the state known to be infected remains at 124, consisting of 106 red pine and 18 Scots pine plantations. This represents 842 and 150 acres respectively, for a total of 992 acres infected. Another six plantations were infected at one time, but have since had the disease eradicated or the trees cut. Some recent infection can be found within most of the quarantine zone.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 11. 1990 Mapped Areas of Beech Decline and Mortality Due to Beech Bark Disease

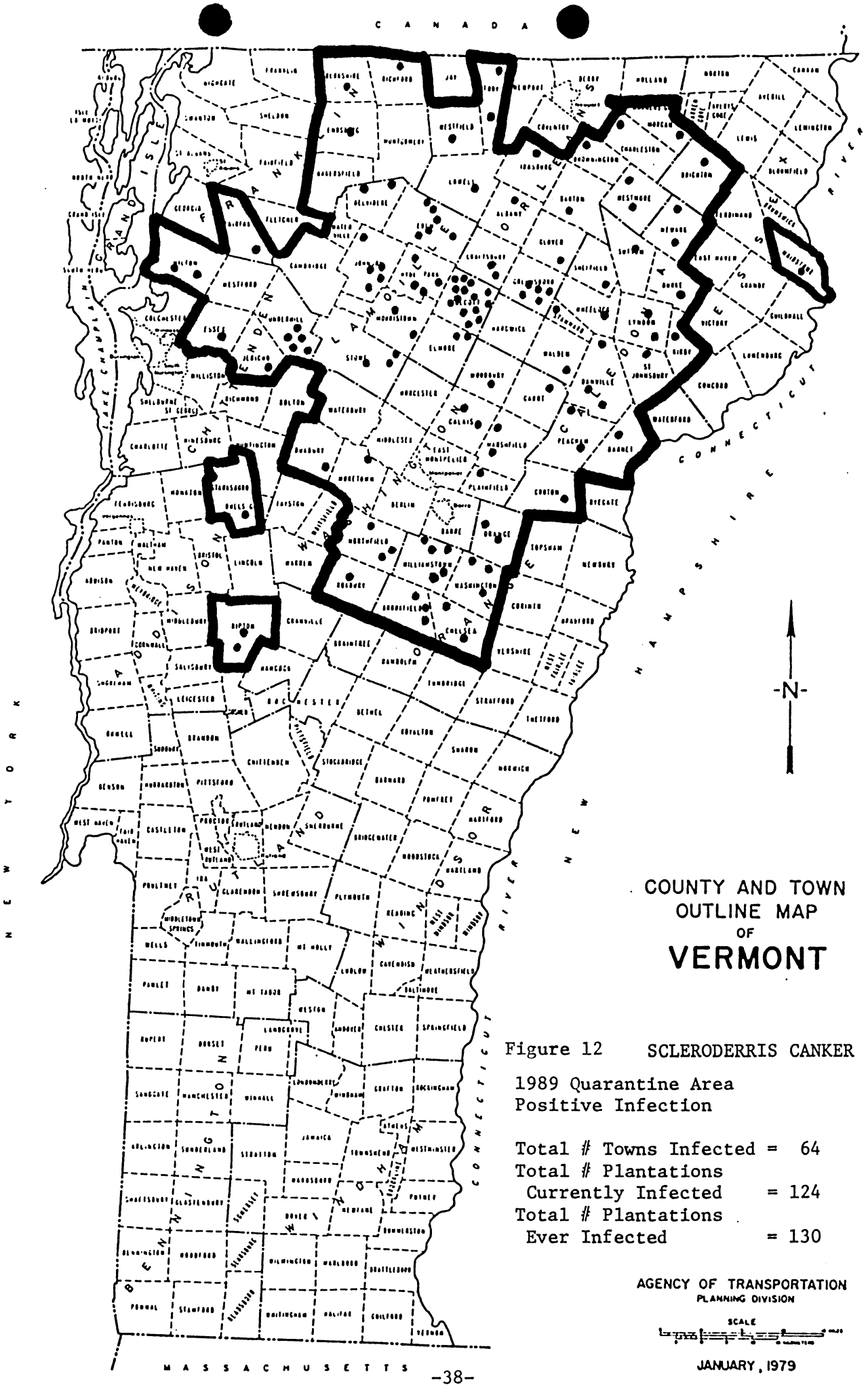
Mapped areas approximate; not to scale.

Total area mapped in 1990 = 1,691 acres

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY, 1979



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 12 SCLERODERRIS CANKER

1989 Quarantine Area
Positive Infection

Total # Towns Infected = 64
Total # Plantations
Currently Infected = 124
Total # Plantations
Ever Infected = 130

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PLANNING DIVISION

SCALE

JANUARY, 1979

White Pine Blister Rust, caused by Cronartium ribicola, continues to cause some mortality of Christmas trees, ornamentals and regeneration. Damage was reported for 291 acres of Christmas trees in northern Vermont compared to 111 acres in 1989. Most of the damage was light, but 88 acres were moderately damaged. Blister rust damage in forest stands appears to be common, but stable.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annual Canker Fusarium sp.	Sugar Maple		N.O.
Balsam Fir Twig Abnormality Sclerotinia kerneri	Balsam Fir		N.O.
Beech Bark Disease Cryptococcus fagisuga and Nectria coccinea var. faginata			See narrative
Black Knot Dibotryon morbosum	Cherry	Widespread	Remains common
Butternut Canker Sirococcus clavigignenta-juglandacearum	Butternut		No new reports
Caliciopsis Canker Caliciopsis pinea	White Pine	Throughout	Remains common
Chestnut Blight Cryphonectria parasitica	Chestnut	Monkton	Several roadside trees affected
Cytospora Canker Leucostoma Kunzei	Blue Spruce	Widespread	Past damage still evident

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Diplodia Shoot Blight *Diplodia pinea* (*Sphaeropsis pinea*)	Red Pine	Bristol	Heavy damage to ornamental
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Remains common
Eastern Dwarf Mistletoe *Arceuthobium pusillum*	Red Spruce		N.O.
Fir Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir		N.O.
Fireblight *Erwinia amylovora*	Mountain Ash Apple Pear	Widely scattered	Increasing; numerous homeowner calls in St.Johnsbury area
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking Aspen	Throughout	Remains common; trees frequently break off at canker during heavy snow and ice storms
Maple Canker *Steganosporium sp.* *Nectria sp.*			Not observed; was somewhat common in 1989 and abundant in 1988
Oak Wilt *Ceratocystis fagacearum*	Oaks		No suspects detected by trained observers during aerial flights
Sapstreak *Ceratocystis coerulescens*	Sugar Maple		N.O.
Scleroderris Canker *Asocalyx abietina*			See narrative

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine		No new sites
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple	St.Johnsbury	One ornamental maple affected
White Pine Blister Rust *Cronartium ribicola*	White Pine		See narrative
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine		Noticeably more abundant this year; caused mostly moderate damage to 200 acres of Christmas trees compared to 97 acres of mostly light to moderate damage in 1989

FOLIAGE DISEASES

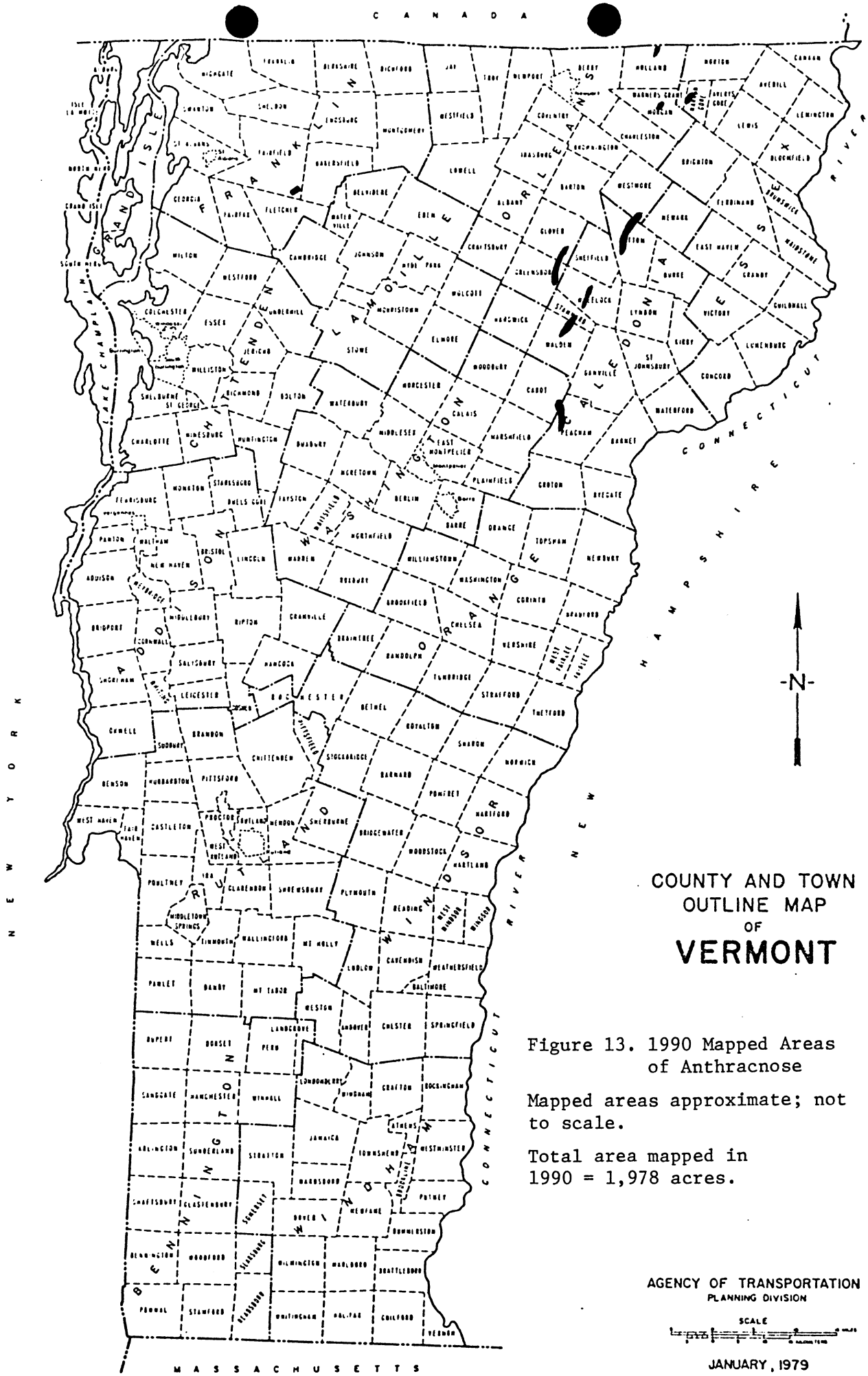
Anthracnose, caused by Gloeosporium spp., was common everywhere on sugar maple and a variety of other hardwood species by mid to late summer. Damage to sugar maple was aerially detected on 1,938 acres in the Northeast Kingdom and 40 acres in Franklin County for a total of 1.978 acres (Table 10, Figure 13).

Table 10. Mapped Acres of 1990 Anthracnose Damage

County	Acres
Caledonia	1059
Essex	295
Franklin	40
Orleans	584
Total	1978

FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose Gloeosporium spp.	Sugar Maple		See narrative
Cedar-Apple Rust Gymnosporangium juniperi-virginianae	Eastern Red Cedar Apple		N.O.
Cyclaneusma Needlecast (formerly Naemacyclus) Cyclaneusma minus	Scots Pine	Throughout	Increasingly common; reported as a problem in 427 acres of Christmas trees compared to 68 acres in 1989 causing heavy needle loss in half of the plantations visited



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 13. 1990 Mapped Areas of Anthracnose

Mapped areas approximate; not to scale.

Total area mapped in 1990 = 1,978 acres.

AGENCY OF TRANSPORTATION
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SCALE

JANUARY, 1979

FOLIAGE DISEASE

DISEASE	HOST(S)	LOCALITY	REMARKS
European Larch Needlecast *Mycosphaerella laricina*	European Larch		N.O.
Fir-Fern Rust *Uredinopsis mirabilis*	Balsam Fir		Not observed despite rainy weather; temperatures during needle elongation probably too cool
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Widely scattered	Presently less common than Cyclaneusma; detected in only two Christmas tree plantations (47 acres)
Poplar Leaf Bronzing Virus or virus-like causal agent	Balsam Poplar	Caledonia Orleans Counties	Remains common, but not as noticeable this year
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir	Waterbury	Remains present, causing some heavy needle loss
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce White Spruce	Widespread	Increasingly more common on Christmas trees and ornamentals
Swiss Needlecast *Phaeocryptopus gaumanni*	Douglas Fir	Brookfield Cornwall	Heavy damage to some Christmas tree plantations
Stigmina spp.	No. White Cedar	Concord	Smothering lower foliage of heavily mulched ornamentals
Tar Spot *Rhytisma acerinum*	Red Maple Sugar Maple	Throughout	Common this year

ROOT ROTS

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*			N.O.
Shoestring Root Rot *Armillaria spp.*	Many	Throughout	Remains common on declining trees; appeared to be killing plantation white spruce in Washington

DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

Ash Dieback remains common in the Champlain Valley area, especially where the basal area of white ash is substantial (i.e., 30% or more). Ash yellows, a mycoplasma-like organism, continues to be a factor in these lower elevation sites, especially in sites that are abandoned farm lands.

Birch Decline and scattered mortality remains noticeable in scattered locations, particularly in north-central Vermont. Dieback may be associated with past birch leaf miner defoliation in some areas.

Larch Decline associated with past outbreaks of the eastern larch beetle has largely subsided, although older dead trees are still noticeable. No new areas of larch decline were detected by aerial survey this year for the first time in many years. Ample rainfall during the past two years has probably been a major factor in this change. In 1988, 646 acres of new larch decline were detected, and this dropped to 46 acres in 1989.

Maple Decline continues to be a concern, but there were no new problem areas reported this year. Hardwood stands throughout much of the region, except for areas of moderate to heavy thrips defoliation, generally appeared to be in excellent health this year compared to past years. This was an excellent growing season due to the plentiful rainfall, and maple foliage generally stayed green a little later into the autumn than usual, with very little early leaf color noticeable this year.

Snow Damage from an early winter storm that began on 10 November caused unusually heavy limb and tree breakage throughout most of the region except for the Connecticut River Valley and Champlain Valley areas. Heavy winds following the storm continued to blow down trees, and many residences were without electrical power for up to a week. Pines and balsam fir were particularly heavily damaged. Fifteen acres of red pine (Howe Block) on state land in Waitsfield received heavy damage (i.e., probably 20% loss).

White Pine Needle Blight was largely absent for the third consecutive year. Only a few scattered white pines in Orange and Washington Counties were observed to have some symptoms of this malady on current year needles.

Winter Injury was common for some ornamentals this year, as well as for Christmas trees. Of the pine Christmas tree plantations inspected in northern Vermont, nearly half of them (337 acres) had some winter injury. Species affected were white pine, Scots pine, and white spruce. Moderate to heavy damage was reported for 234 acres, most of which was Scots pine. The unusually cold temperatures in December, 1989 when trees had not fully hardened off, are likely to have been a factor in this injury.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	Many	Throughout	Populations remain high with flooding damage common
Deer			No damage reported
Moose			No damage reported
Mouse			N.O.
Porcupine	Many	Widely scattered	Increasing in Franklin, Chittenden and Addison counties, but stable or decreasing elsewhere
Sapsucker	White Birch Sugar Maple Norway Maple Hemlock	Widespread	Remains common
Squirrel	Maple Tubing	Widespread	Complaints decreasing